Rule 74.19.1. Screen Printing Operations (Adopted 6/11/96, Revised 11/11/03)

A. Applicability

The provisions of this rule apply to:

1. Any person who uses any ink, coating, adhesive, resist, or solvent containing ROC (Reactive Organic Compounds) in a screen printing operation. Any screen printing operation subject to the adhesive requirements in this rule shall be exempt from the requirements of Rule 74.20.

2. Any person in the District who manufactures, specifies the use of, sells, or offers for sale any ink, coating, adhesive, resist, or solvent containing ROC for use in a screen printing operation in the District.

3. The provisions of this rule shall become effective on December 1, 1996.

B. Requirements

1. ROC Content of Screen Printing Materials

No person shall apply to any substrate any screen printing material which contains, as applied, a total amount of ROC in excess of the applicable limit specified below:

a. For screen printing inks, coatings, adhesives, and resists except as specified in subsection B.1.b:

SCREEN PRINTING MATERIAL	ROC LIMIT Grams per Liter / Pounds per Gallon of Coating, Less Water and Less Exempt Organic Compounds	
	g/L	Lbs/gal
Printing Ink:	400	3.3
Coating:	400	3.3
Adhesive:	400	3.3
Metallic Inks:	600	5.0
Resists:	600	5.0
Extreme Performance Inks and Coatings:	800	6.7

b. For screen printing inks, coatings, and adhesives used in or on the following products or substrates:

PRODUCT/SUBSTRATE	ROC LIMIT Grams per Liter / Pounds per Gallon of Coating, Less Water and Less Exempt Organic Compounds	
	g/L	Lbs/gal
Water Slide Decals:	800	6.7
Ceramic Decals:	800	6.7

2. No person shall use a solvent to perform cleaning operations unless the solvent complies with both the ROC content and ROC Composite Partial Pressure limits of the following applicable requirements:

	LIMITS		
	ROC Grams per Liter / Pounds per Gallon of Material		ROC Composite Partial Pressure
SOLVENT CLEANING ACTIVITY	g/L	Lbs/gal	mmHG @ 20°C (68°F)
Surface Preparation	200	1.67	25
Clean-up	200	1.67	25
Spotting Fluid	400	3.30	25
Application Equipment Cleaning:			
Process Cleaning	1070	8.92	5
Ink Removal	950	7.92	5

3. No person shall perform cleaning operations unless one of the following cleaning devices or methods is used:

   a. Wipe cleaning;

   b. Spray bottles or containers with a maximum capacity of 32 fluid ounces from which solvents are applied without propellant-induced force;

   c. Cleaning equipment that complies with the equipment and operating requirements of Rule 74.6.

4. In lieu of the requirements of Subsection B.1, emissions of ROC, excluding emissions from clean up operations, may be controlled by an emission capture and control system, which reduces ROC emissions to the atmosphere, provided that:

   a. During any period of continuous operation not to exceed 24 hours, the capture and control system shall have a combined efficiency of at least 75 percent, by weight.

   b. The collection system shall vent all drying oven exhaust to the control device and shall have one or more inlets for collection of fugitive emissions; and,

   c. During any period of operation of a thermal incinerator, combustion temperature shall be continuously monitored; and,

   d. During any period of operation of a catalytic incinerator, catalyst temperature shall be continuously monitored; and,

   e. Written approval for such equipment, in the form of an Authority to Construct and Permit to Operate, is received from the Air Pollution Control Officer (APCO).

5. ROC materials shall be stored in nonabsorbent, nonleaking containers, which shall be kept closed except when adding or removing material or during cleaning operations.

6. Any person selling or offering for sale any ink, coating, adhesive, resist, or solvent subject to this rule shall include the following information on the product container or a data sheet supplied with the product:

   a. Material name, manufacturer identification, specific mixing instructions, density, and ROC content, as applied.

   b. The ROC content of inks, coatings, adhesives, and resists expressed as defined in Subsection G.10.

   c. The ROC content of solvents expressed as defined in Subsection G.11. The composite partial vapor pressure expressed as specified in Subsection E.3.

7. No person shall sell, distribute, or require any other person to use in the District any ROC-containing material subject to the provisions of this rule which, when thinned or reduced according to the manufacturer's recommendation for application and use, does not meet the applicable ROC limits required by this rule for the specific application.

C. Exemptions

1. The requirements of Subsections B.1 and B.2 shall not apply to a facility which emits less than 200 pounds of ROC per rolling period of 12 consecutive calendar months from the use of screen printing materials.

2. The requirements of Subsection B.1 shall not apply to screen printing operations performed by manufacturers of screen printing materials for purposes of conducting performance laboratory tests or doing research and development, provided that the ROC emissions from such laboratory tests and/or research and development are less than 200 pounds per rolling period of 12 consecutive calendar months.

3. The ROC content limit for aerosol platen adhesive does not apply if the total facility use of platen adhesive does not exceed 150 ounces in any month.

4. Production of electronic circuits.

5. The prohibition specified in subsection B.7 shall not apply to persons selling to, distributing to, or requiring other persons who are operating an approved emission control system under subsection B.4 or operating under a variance granted by VCAPCD Hearing Board, or operating pursuant to subsection C.1 or subsection C.2.

D. Recordkeeping Requirements.

Any person subject to this rule shall:

1. Maintain a current file for each ink, coating, adhesive, and resist in use and in storage. The file shall include a data sheet or material list giving material name, manufacturer identification, specific mixing instructions, density, and ROC content as applied.

2. Maintain a current file for each solvent in use and in storage. The file shall include a data sheet or material list giving material name, manufacturer identification, ROC content and ROC composite partial pressure.

3. Maintain records showing the amount of inks, coatings, adhesives, resists, and solvents used:

    a. If only compliant inks, coatings, adhesives, resists, and solvents are used, records shall be kept on a monthly basis. For reporting purposes, ink lines may be grouped or each ink may be reported separately.

    b. If noncompliant inks, coatings, adhesives, or resists are used and compliance is achieved through the use of emission control equipment:

        1) Ink, coating, adhesive, and resist usage records shall be kept on a daily basis.

        2) Solvent usage records shall be kept on a monthly basis.

        3) Key system operating parameters for emission control equipment shall be recorded on a daily basis as specified in the Permit to Operate.

4. If operating pursuant to subsections C.1, C.2, or C.3, records necessary to substantiate exemption status shall be kept on a monthly basis.

5. Retain inventory, usage, and emission control equipment operation records for a minimum of two years and make these records available to the Air Pollution Control Officer upon request.

E. Test Methods

1. Measurement of the ROC content of inks, coatings, adhesives, resists, and solvents shall be conducted and reported in accordance with EPA Reference Method 24 and ARB Method 432 for determination of exempt organic compounds as necessary.

2. The metal content of metallic inks shall be determined by SCAQMD Method 311 (Determination of Percent Metal in Metallic Coatings by Spectrographic Method) contained in the SCAQMD "Laboratory Method of Analysis for Enforcement Samples" manual.

3. ROC composite partial pressure of a solvent shall be calculated using a published source such as: T. Boublik, V. Fried and E. Hala, "The Vapor Pressure of Pure Substances," Elsevier Scientific Publishing Co., New York (1973), Perry's Chemical Engineer's Handbook, McGraw-Hill Book Company, CRC Handbook of Chemistry and Physics, Chemical Rubber Publishing Company (1986-87), and Lange's Handbook of Chemistry, John A. Dean, editor, McGraw-Hill Book Company (1985). The true vapor pressure of a component in a solvent mix may be determined by ASTM Method D2879-86. The ROC composite pressure of a solvent mix consisting entirely of ROC may be determined by ASTM Method D2879-86.

4. The capture and control efficiency of air pollution control equipment, as specified in Subsection B.4, shall be determined using applicable methods in 40 CFR 52.741.

G. Definitions

For purposes of this rule, the following definitions shall apply:

1. "Adhesive:" Any substance that is used to bond one surface to another surface.

2. "Application Equipment Cleaning:" The removal of coating, adhesive or ink from application equipment.

3. "Ceramic Decals:" Water-slide decals which are used to transfer images onto ceramic materials by firing above $800^{O}F$.

4. "Ceramic Decal Ink:" Any ink which is screen printed onto treated paper stock and is used in the production of ceramic decals.

5. "Cleanup:" The removal of uncured coating, adhesive or ink from any surface, oversprayed surfaces, and hands, excluding application equipment.

6. "Coating:" A layer of material applied to a substrate in a substantially unbroken film.

7. "Electronic Circuit:" A product which consists of a substrate and a circuitry created by screen printing an ink, which transmits electricity, on the substrate.

8. "Exempt Organic Compounds:" As defined in Rule 2 of these rules.

9. "Extreme Performance Screen Printing Materials:" An ink or coating used in screen printing on a non-porous substrate that is designed to resist or withstand any of the following: more than

two years of outdoor exposure; exposure to industrial grade chemicals, solvents, acids, detergents, oil products, or cosmetics; temperatures exceeding 76 degrees Celsius (169^{o} F); vacuum forming, embossing, or molding.

10. "Grams of ROC Per Liter of Coating, Less Water and Less Exempt Organic Compounds:" The weight of ROC per combined volume of ROC and material solids, is calculated by the following equation:

$$\text{Grams of ROC per Liter of Coating, Less Water and Less Exempt Organic Compounds} = \frac{W_s - W_w - W_{es}}{V_m - V_w - V_{es}}$$

Where:
- W_s = weight of volatile compounds, in grams
- W_w = weight of water, in grams
- W_{es} = weight of exempt organic compounds, in grams
- V_m = volume of material, in liters
- V_w = volume of water, in liters
- V_{es} = volume of exempt organic compounds, in liters

11. "Grams of ROC Per Liter of Material:" The weight of ROC per volume of material is calculated by the following equation:

$$\text{Grams of ROC per Liter of Material} = \frac{W_s - W_w - W_{es}}{V_m}$$

Where:
- W_s = weight of volatile compounds, in grams
- W_w = weight of water, in grams
- W_{es} = weight of exempt organic compounds, in grams
- V_m = volume of material, in liters

12. "Ink Line:" A group of inks from the same manufacturer with similar properties, such as ROC content and density.

13. "Ink Removal:" Final cleaning of application equipment prior to color change or storage of the application equipment.

14. "Metallic Ink:" Ink containing at least 50 grams of metal per liter of ink (0.4 lb/gal) as applied and which is not used in the manufacture of an electronic circuit.

15. "Non-porous Substrate:" A substrate that has no tiny pores or openings in its physical structure in which to absorb fluids. Non-porous substrates include, but are not limited to, glass, metals and plastics.

16. "Plastics:" Man-made materials, excluding rubber, produced from high molecular weight synthetic or natural organic polymers which are capable of being shaped or flowing under heat and pressure into desired forms at some stage of their manufacture. Plastics

include, but are not limited to, acrylonitrile butadiene styrene (ABS), acrylic, butylate, epoxy, vinyl, polyvinyl chloride (PVC), polyethylene, polypropylene, polystyrene, polycarbonate, polyamide, polyester, polyurethane and man-made textile.

17. "Platen Adhesive:" An adhesive used to hold the porous substrate being printed in place during the application of the printing ink(s).

18. "Printing:" Any operation that imparts a color, design, alphabet, symbol, or numeral on a substrate.

19. "Printing Ink:" Any viscous fluid used in printing, impressing, or transferring an image onto a substrate.

20. "Process Cleaning:" The removal of uncured coating, adhesive or ink from application equipment during the screen printing operation. This would include the use of a screen opener.

21. "Resists:" Inks that; a) form the required alphabets, numerals, designs, or symbols on the surface of the substrate; b) protect the screen printed or covered surface from the subsequent application of etching or plating solution; and c) are later removed from the substrate by a resist stripper. Resists applications include, but are not limited to, etched electronic circuits, display screens, chemical milling of parts, nameplates and signage.

22. "ROC (Reactive Organic Compounds):" As defined in Rule 2 of these rules.

23. "ROC Composite Partial Pressure:" The sum of the partial pressures of the compounds defined as ROCs. ROC composite partial pressure is calculated as follows:

$$PP_C = \frac{\sum_{i=1}^{n} \left(W_i\right)\left(VP_i\right) \Big/ \left(MW_i\right)}{\left(W_w / MW_w\right) + \sum_{e=1}^{n} \left(W_e / MW_e\right) + \sum_{i=1}^{n} \left(W_i / MW_i\right)}$$

Where:
W_i = Weight of the "i"th ROC compound, in grams
W_w = Weight of water, in grams
W_e = Weight of the "e"th exempt organic compound, in grams
MW_i = Molecular weight of the "i"th ROC compound, in g/(g-mole)
MW_w = Molecular weight of water, in g/(g-mole)
MW_e = Molecular weight of the "e"th exempt organic compound, in g/(g-mole)
PP_C = ROC composite partial pressure at 20 C, in mm Hg
VP_i = Vapor pressure of the "i"th ROC compound at 20 C, in mm Hg.

24. "Screen Opener:" A solvent sprayed on stencil openings to dissolve printing ink that is clogging those openings.

25. "Screen Printing:" A printing process in which printing ink, coating, or adhesive material is passed through a taut web or fabric to which a refined form of stencil has been applied. The stencil openings determine the form and dimensions of the imprint.

26. "Screen Printing Equipment:" Equipment used for applying screen printing materials, including the flash-off area, ovens or dryers, conveyors, or other equipment operating as part of screen printing operations.

27. "Screen Printing Materials:" Any inks, coatings, or adhesives, including added thinners or additives, used in screen printing.

28. "Screen Printing Operations:" Operations which include screen printing and any subsequent drying, curing, or conveying of the screen-printed substrate.

29. "Spotting Fluid" A solvent used to remove cured plastisol ink from fabric.

30. "Surface Preparation:" The removal of contaminants from a substrate prior to coating, adhesive or ink application. Surface preparation does not include the removal of cured coatings.

31. "Water Slide Decals:" Decals which are screen printed onto treated paper stock, and are removable from the stock by the dissolution of an underlying, water-soluble adhesive or a similar carrier.

32. "Water Slide Decal Adhesive:" Any adhesive which is screen printed onto treated paper stock, in the production of water slide decals.

33. "Wipe Cleaning:" The method of cleaning a surface by physically rubbing it with a material or device such as a rag, paper, brush or cotton swab moistened with a solvent.